

glucinum was determined in turpentine, of which the specific heat was found to be 0·4231, and with the following results :—

I	0·4326
II	0·4264
III	0·4357

Mean..... 0·4316

and with a mean error of 0·8 per cent. Making a correction for the impurities contained in the metal, its true specific heat would be 0·4453, whence if the atomic weight is 13·65, the atomic heat becomes 6·08. This must, therefore, be the true atomic weight, and not two-thirds of this, or 9·1.

The number found by Nilson was somewhat lower than this (0·4079), and the above results may be slightly too high, firstly from hygroscopic moisture, and secondly from heat produced when the liquid was absorbed by the porous metal. About 0·66 gramme of the metal was used for the determinations, and it was compressed to a compact disk in a steel mortar.

The author is continuing the research.

- III. "On a New Crinoid from the Southern Sea." By P. HERBERT CARPENTER, M.A., Assistant Master at Eton College. Communicated by W. B. CARPENTER, C.B., M.D., F.R.S. Received March 15, 1883.

(Abstract.)

Among the collections of the late Sir Wyville Thomson, a small *Comatula* has recently been discovered which was dredged by the "Challenger" at a depth of 1,800 fathoms in the Southern Sea. Although it is unusually small, the diameter of the calyx being only 2 millims., the characters presented by this form are such as to render it by far the most remarkable among all the types of recent Crinoids, whether stalked or free. The name proposed for it is *Thaumatocrinus renovatus*.

It has only five arms, and in this respect resembles *Eudiocrinus*. But the basals, instead of becoming transformed into a rosette as in that genus, persist on the exterior of the calyx and form a closed ring of relatively large plates, which rest upon the centrodorsal. They support a ring of ten plates, five of which, alternating with the basals, bear the arms and are therefore the radials. These radials, however, do not meet one another laterally; for they alternate with five plates slightly smaller than themselves, which rest upon the

basals, and, with one exception, terminate in a free edge at the margin of the disk. The exception is the interrarial of the anal side, which bears a short and tapering armlike appendage of five or six joints. It has no special relation to the anal tube, the lower part of which, like the peripheral portion of the disk, bears a pavement of anambulacral plates. But the centre of the disk is occupied by a relatively large and substantial oral pyramid, so that the disk in its general aspect resembles that of *Hyocrinus*.

Thaumatocrinus is thus distinguished by four striking peculiarities:—

(1.) The presence of a closed ring of basals upon the exterior of the calyx.

(2.) The persistence of the oral plates of the larva, as in *Hyocrinus* and *Rhizocrinus*.

(3.) The separation of the primary radials by interradians which rest on the basals.

(4.) The presence of an arm-like appendage on the interrarial plate of the anal side.

Taking these in order—

(1.) No adult *Comatula*, except the recent *Atelecrinus* and some little known fossils, has a closed ring of basals; and even in *Atelecrinus* they are quite small and insignificant.

(2.) In all recent *Comatulæ*, in the *Pentacrinidæ* and in *Bathycrinus*, the oral plates of the larva become resorbed as maturity is approached. In *Thaumatocrinus*, however, they are retained, as in *Hyocrinus*, *Rhizocrinus*, and *Holopus*, representatives of three different families of Neocrinoids.

(3.) There is no Neocrinoid, either stalked or free, in which the primary radials remain permanently separated as they are in *Thaumatocrinus*, and for a short time after their first appearance in the larva of ordinary Crinoids. The only Palæocrinoids presenting this feature are certain of the *Rhodocrinidæ* (as understood by Wachsmuth and Springer), e.g., *Reteocrinus*, *Rhodocrinus*, *Thylacocrinus*, &c. In the two latter, and in the other genera which have been grouped together with them into the section *Rhodocrinites* (W. and S.), there is a single interrarial intervening between every two radials, and resting on a basal just as in *Thaumatocrinus*. But in the Lower Silurian *Reteocrinus* (of Billings; emend W. and S.) the interrarial areas contain a large number of minute pieces of irregular form and arrangement.

(4.) It is only, however, in *Reteocrinus*, and in the allied genus *Xenocrinus*, Miller, which is also of Lower Silurian age,* that an anal appendage similar to that of *Thaumatocrinus* is to be met with.

* *Reteocrinus* occurs in the Trenton Limestone of Ottawa and in the Hudson River Group of Indiana and Ohio. *Xenocrinus* has as yet been found in the latter

Of the four distinguishing characters of *Thaumatoerinus*, therefore, one appears in one or perhaps in two genera of *Comatulæ*; another is not to be met with in any *Comatula*, though occurring in certain stalked Crinoids; while the two remaining characters are limited to one family of the Palæocrinoids, one of them being peculiar to one, or at most two genera, which are confined to the Lower Silurian rocks.

Their reappearance in such a specialized type as a recent *Comatula* is, therefore, all the more striking.

IV. "On the Structure and Functions of the Eyes of Arthropoda." By B. THOMPSON LOWNE, F.R.C.S., Lecturer on Physiology in the Middlesex Hospital Medical School, Examiner in Physiology in the Royal College of Surgeons, formerly Arris and Gale Lecturer on Anatomy and Physiology in the Royal College of Surgeons. Communicated by Professor FLOWER, F.R.S. Received March 30, 1883.

(Abstract.)

Three distinct forms of eye exist in the Arthropoda; the Compound eye, the Simple Ocellus, and the less known Compound Ocellus, common in larval insects, first described by Dr. Landois.

The relationship of the Compound eye to the Simple Ocellus is shown to be very distant, although I believe that these two types have been evolved from a common but very rudimentary primitive type. On the other hand, that between the Compound eye and the Compound Ocellus of a larval insect, is very close, the Compound eye being merely an aggregation of a great number of these ocelli, variously modified in the more highly differentiated Insects and Crustaceans. A fourth form of eye exists, in which the Ocelli are less closely united; this forms a connecting link between the compound eye and the compound ocellus. It is found in the Isopods, and may be conveniently termed the Aggregate eye.

The Simple Ocellus consists essentially of a pigmented capsule, behind a convex corneal lens, containing a cellular vitreous, which is separated from the retina by a fine fibrous membrane. The retina itself is a layer of Bacilla, comparable with those of Jacob's membrane in the Vertebrate, except that the highly refractive outer segments of the rods are turned towards and not away from the refractive media. The fibrous membrane, between the rods and the group only. I cannot help suspecting that a better knowledge of this type will lead to its absorption into *Releoerinus*. —P. H. C.